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BRAIN HEMISPHERE SYNCHRONIZATION AND MUSICAL LEARNING

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The Study

Subjects

The subjects were forty first-semester freshmen year training students enrolled in the 1984 Fall Semester at UNC-Greensboro who volunteered to participate. The last four digits of their social security numbers were used to identify and randomly separate the subjects into control and experimental groups.

Hypothesis

The intent of the study was to determine the effectiveness of Hemi-Sync® in accelerating aural recognition of musical intervals. The hypothesis was that students listening to a taped lecture/demonstration with a masked 4 Hz difference frequency would develop a better ability to identify musical intervals than those students without the difference signal.

Procedure

All participating subjects were asked to listen to a forty-minute cassette tape at six different times. The tapes contained a pre-test, a lecture/demonstration, and a post-test. All tapes were identical, except for the masked HEMI-SYNC signal on the experimental group's tapes. The pre-test and post-test each contained fifteen intervals for identification. Five intervals were harmonic, five were melodic-up and five were melodic-down. Each interval was heard twice.

The pitch range for the intervals performed was G to F#. The intervals were equally divided within the range to minimize any gender bias. The study was administered by the staff of the Music Listening Center in the School of Music in a double-blind setting. Multiple copies of the tapes were coded and distributed to the subjects. Files were maintained for each subject and each score-sheet was identified by a session number. Once the study was completed, the data was analyzed by the university's Academic Computer Center.

Results

Statistical analysis did not show significant group differences in learning from session to session. However, subjects in the experimental group achieved higher post-test scores in 54%

of their sessions, in contrast with control-group subjects who performed better on their post-tests in only 28% of their sessions. (See TABLE 1.) Mean score changes for individual subjects also imply a difference between both groups. (See TABLE 2.) This suggests that HEMI-SYNC assisted in maintaining subject attention through the course of each session, which is consistent with the conclusions of previous studies related to HEMI-SYNC and learning.

Table 1
Comparison of Individual Session Scorce Change

Group	n	Positive	Negative	No Change
E	114	62 (54.4%)	39 (34.2%)	13(11.4%)
C	109	31 (28.4%)	56 (51.4%)	22 (20.2%)

Table 2
Comparison of Individual Subject Means

Group	n	Positive	Negative	No Change
E	21	14 (66.7%)	4 (19.0%)	3 (14.3%)
C	19	6 (31.6%)	13 (68.4%)	

One particular aspect of the study had lead to inconclusive results. The presence of the difference frequency on the experimental group's tapes appears to have interfered with the identification of the perfect octave. (The harmonic octave was frequently identified as a minor sixth.) The effect it might have had on the other interval identifications is unknown. Perhaps with more efficient masking, the results may have shown a significant difference between the groups.

There is no concrete evidence to show that the subjects' brainwaves actually responded to the signals. It was mechanically impossible to monitor their sessions with a dual-trace EEG. Such limitations should not pose a problem in research if changes in learning behavior are the basis for research conclusions.

Implications for Further Use and Research

The foregoing study begs for further examination of HEMI-SYNC in a variety of contexts. The HEMI-SYNC Synthesizer, designed for classroom use, requires a minimum of equipment (a pair of speakers or stereo headphones, a cassette player and cassette tapes for masking) and no special facilities. Four optional settings are available to the researcher: Relaxation (theta mixed with delta), Imaging and Affective Learning (theta), Imaging and Attention (theta mixed with beta), and Attention Focusing–Cognitive Learning (theta mixed with delta and beta).

The Imaging and Attention setting would be appropriate to music theory and music appreciation, for which auditory imagery is central. The Attention Focusing–Cognitive Learning setting would also be appropriate to music theory, as well as music history, private lessons and practice on one's instrument. (Different kinds of masking may be necessary when music is being listened to.)

M.J. Wagner and R. Altman have explored biofeedback as a tool to assist in musical learning. They state that brainwave control may be effectively used in the music classroom if there were greater personal control over one's consciousness/attentiveness level.

HEMI-SYNC takes biofeedback a large step forward in achieving this level of "control," because individuals do not have to undergo the lengthy entrapment sessions required by the biofeedback model. Also, these particular brain-states can be learned and reproduced more quickly through on-task utilization. Subjective observations indicate that students are conditioned very quickly to respond to the classroom environment itself, and enter into the focused state even when the signals are not present.

Pre-performance anxiety may be minimized by exposure to theta mixed with delta. This combination accelerates the calming process. As part of a pre-performance process, the use of theta and positive imaging of the future performance itself may be beneficial.

Music education (and education in general) has come to a new and fascinating horizon. The application of HEMI-SYNC within the various areas of music is virtually uncharted research territory. Future study of this phenomenon may have a profound impact upon music learning in a variety of settings. Potential avenues for its use are limited only by the creativity and interest of the researcher.